SNOWFALL.

The *total monthly snowfall* at each station is given in Tables I and II; its geographical distribution is shown on Chart V. This chart also shows the isotherms of minimum 32° and of minimum 40° for the air within the ordinary thermometer shelter. The former isotherm is an approximate limit to possible snow, while the latter is an approximate southern limit to the regions that report frost in exposed localities.

Snowfalls of from 10 to 20 inches were reported from New England and the hilly portions of the Middle Atlantic States; from 5 to 15 inches prevailed over the Lake Region, the upper Mississippi and lower Missouri valleys. Heavy snowfall occurred in the Rocky Mountain and Sierra Nevada ranges, the heaviest reported were 239 inches at Ruby, Colo., 102 at Cisco, Cal., and 112 at Cascade Tunnel, Wash.

On the February weather map of the Canadian service the director, Prof. R. F. Stupart, says: "The precipitation throughout Canada was everywhere below the average."

The *depth of snow on the ground* at the end of the month is given in detail in Table II, and for the winter months is shown on Chart VI; it is also given on the weekly charts of the Climate and Crop Service, published by the Weather Bureau during December to March, inclusive.

In general, at the close of the month there was about 15 to 20 inches in the interior of New England, central New York, upper Michigan; 15 to 35 in western Wisconsin, southern Minnesota; 25 to 50 in northern Minnesota and the eastern portions of North and South Dakota. Heavy snow also lay on the mountains of Colorado, California, Nevada, Idaho, Washington and Oregon.

"In British Columbia the depth is at most points less than at the same date last year: Barkerville, 20 inches; Glacier House, 72; Revelstoke, 36; Donald, 36; from Kamloops to the coast, along the line of the Canadian Pacific, none. In the Northwest Territories, last year, there was only a thin coating on the prairies, but this year the amount was very considerable, Edmonton and Battleford, 16 inches on the level, and Qu'Appelle, 29; in Manitoba the amount is much greater than a year ago, Minnedosa, 34 inches on a level; Winnipeg, 18. In the Lake Superior district the amount is about the same as it was last year, but from Lake Huron eastward somewhat less, except in the extreme portions of Ontario and the Maritime Provinces, where it is slightly greater."

ICE.

The *thickness of ice* in the rivers and harbors is shown in detail in the bulletins published every Monday by the Weather Bureau, and is also given in some detail in the chapter on "River and Flood Service." The more prominent characteristic data for the first and last Mondays, February 1 and 22, respectively, are:

Connecticut, Middletown, 6 and 4 inches; Iowa, Dubuque, 13 and 9, Sioux City, 19 and 19; Maine, Bangor, 16.5 and 21.5, Eastport, 18 and 15, Gardiner, 14.6 and 15.0, Lewiston, 20 and 21; Massachusetts, Concord, 14 and 10; Michigan, Alpena, 6 and 2, Detroit, 11 and 12, Port Huron, 10 and 7, Sault Ste. Marie, 9.5 and 15.0; Minnesota, Duluth, 24.0 and 24.5, Moorhead, 28 and 30, St. Paul, 23 and 20; Nebraska, Omaha, 11.0 and 7.5, Valentine, 21 and 19; New York, Albany, 10 and 8, Oswego, 15.5 and 17.0, Rochester, 9.5 and 11; North Dakota, Bismarck, 33 and 33, Williston, 24 and 34; Ohio, Cleveland, 9 and 6, Sandusky, 10 5; Pennsylvania, Erie, 10 and 11; South Dakota, Pierre, 20.0 and 22.5, Yankton, 20 and 22; Vermont, Brattleboro, 12.5 and 5.0; Wisconsin, Greenbay, 10.5 and 8.5, La Crosse, 13.0 and 7.5.

The ice broke up as follows: Connecticut River, Brattleboro, Vt., February 8; Missouri River, Hermann, Mo., February 8; Susquehanna River, Harrisburg, Pa., February 7, and Columbia, February 8.

Up to February 23, the ice harvest was good or excellent at Lewiston, Me., Dubuque and Sioux City, Iowa, and Harrisburg, Pa., and above Albany, N. Y.

In Canada.—Prof. R. F. Stupart publishes the following reports of the thickness of ice at the close of the month:

Northwest Territories, Battleford, 24 inches; Swift Current, 28; Regina, 30. Ontario, Port Arthur, 30 inches; Parry Sound, 15; Southampton, 23; Port Stanley, 10; Kingston, 15; Port Dover, 13; Stony Creek, 11; Orillia, 18; Lakefield, 20; Welland, 18; Midland, 17; Mattawa, 22; Smiths Falls, 16; Bayfield, 24; Sparrow Lake, 21; Clontarf, 30. Maritime Provinces, Chatham, 22 inches; St. Andrews, 32; Pictou, 18; Sydney, 12; Charlottetown, 12; Fredericton, 30.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 22. Arizona, 7, 9, 21. Arkansas, 1, 7, 22, 28. California, 1, 2, 11, 15, 18, 19, 20. Georgia, 1, 5. Illinois, 20, 21. Indiana, 20. Kansas, 21. Kentucky, 18 to 22. Louisiana, 1, 11, 15. Mississippi, 7, 12, 22. Missouri, 19 to 22, 25. Oklahoma, 3, 20. Oregon, 2, 8, 12, 13, 16, 17, 19, 20. South Carolina, 8, 13, 14, 17. Tennessee, 22. Texas, 3, 10. Washington, 7, 11, 12, 16, 20. West Virginia, 22.

SLEET.

The following are the dates on which sleet fell in the respective States:

Arizona, 12, 20, 21. Arkansas, 1, 3. California, 1, 2, 3, 14, 15, 17 to 21, 28. Colorado, 21. Connecticut, 3, 8, 15, 16, 20, 22, 23. District of Columbia, 2, 3, 8, 11, 12, 18, 20. Georgia, 1, 4, 25. Idaho, 4, 5, 10, 15, 16. Illinois, 1, 4, 5, 7, 8, 19 to 22, 28. Indiana, 1, 5, 11, 15, 20, 21, 22. Iowa, 3, 9, 10, 20, 21. Kansas, 3, 10, 11, 13, 21. Kentucky, 1, 2, 4, 8, 18, 26, 28. Louisiana, 23. Maine, 7, 14, 18. Maryland, 2 to 6, 11, 12, 20, 25. Massachusetts, 22, 23. Michigan, 5, 8, 11, 20, 21, 22. Minnesota, 3, 5, 13, 19, 20. Mississippi, 1, 4, 23, 24. Missouri, 3, 4, 5, 7 to 11, 14, 15, 20, 21, 22, 24, 25. Montana, 4, 12, 28. Nebraska, 6, 9, 10, 13, 14, 19, 20, 21, 28. Nevada, 1 to 5, 11, 12, 16. New Hampshire, 22, 23. New Jersey, 2, 3, 6, 8, 12, 15, 16, 20, 23. New York, 2, 6, 12, 15, 16, 20, 22, 23. North Carolina, 1, 2, 5, 20, 25. North Dakota, 3, 5, 15. Ohio. 1, 2, 5, 6, 8, 12, 14, 15, 18 to 22. Oklahoma, 4. Oregon, 2, 3, 11, 12, 15, 16, 20. Pennsylvania, 1, 2, 3, 5, 6, 11, 12, 14, 15, 16, 19 to 23. South Carolina, 1, 25 to 28. South Dakota, 3, 5, 9, 10, 11. Tennessee, 2, 4, 15, 18, 25, 26. Texas, 11. Utah, 1, 2, 12, 17, 19. Vermont, 16, 22. Virginia, 1, 2, 5, 6, 7, 11, 12, 18, 20, 21, 22, 26. Washington, 1, 2, 4 to 7, 10 to 13, 15 to 18, 21. West Virginia, 3, 5, 6, 11, 12, 18, 19, 20, 22. Wisconsin, 3, 5, 13, 20.

WIND.

The *prevailing winds* for February, 1897, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table VIII. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

HIGH WINDS.

Maximum wind velocities are given in Table I, which also gives the altitudes of the Weather Bureau anemometers above the ground. Maxima of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five

minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Amarillo, Tex	21	52	w.	Fort Canby, Wash.	7	52	se.
Atlantic City, N. J.	2	52	ne.	Havre, Mont.	16	54	sw.
Block Island, R. I.	2	57	e.	Huron, S. Dak	19	50	se.
Do	3	70	ne.	Jupiter, Fla	5	51	se.
Do	12	60	ne.	Kittyhawk, N. C.	3	60	n.
Buffalo, N. Y.	14	50	sw.	New Haven, Conn.	6	56	e.
Do	23	50	w.	New York, N. Y.	6	60	e.
Do	27	54	w.	San Antonio, Tex	23	60	n.
Charleston, S. C	6	56	se.	Tatoosh Island, Wash.	11	54	nw.
Chicago, Ill	21	51	e.	Do	15	60	w.
Cleveland, Ohio	23	57	w.	Williston, N. Dak	16	60	nw.
El Paso, Tex	6	57	sw.	Winnemucca, Nev.	5	50	sw.
Do	19	56	sw.				

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 22 regular stations of the Weather Bureau by its photographic, and at 36 by its thermal effects. At one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table X for each hour of local mean time. In order to complete the record of the duration of cloudiness these registers are supplemented by special personal observations of the state of the sky near the sun in the hours after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence there results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table X.

Difference between instrumental and personal observations of sunshine.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
		H'rs.	%	%	%	%	%
Tampa, Fla	T.	314.1	58	.....	.....	63	+ 5
Galveston, Tex	P.	313.1	45	50	+ 5	.....	.....
New Orleans, La	T.	312.1	24	.....	.....	24	0
Savannah, Ga	P.	309.8	35	34	− 1	.....	.....
Vicksburg, Miss	T.	309.8	52	.....	.....	54	+ 2
Charleston, S. C	T.	308.3	43	.....	.....	43	0
Phœnix, Ariz	P.	308.3	63	70	+ 7	.....	.....
San Diego, Cal	P.	308.3	54	67	+13	.....	.....
Atlanta, Ga	T.	307.1	38	.....	.....	36	− 2
Los Angeles, Cal	P.	307.1	58	65	+ 7	.....	.....
Wilmington, N. C	T.	307.1	46	.....	.....	50	+ 4
Chattanooga, Tenn	T.	305.8	35	.....	.....	31	− 4
Little Rock, Ark	T.	305.8	33	.....	.....	49	+16
Nashville, Tenn	T.	305.0	40	.....	.....	46	+ 6
Raleigh, N. C	T.	305.0	40	.....	.....	53	+13
Santa Fe, N. Mex	P.	305.0	46	60	+14	.....	.....
Fresno, Cal	T.	303.3	50	.....	.....	58	+ 8
Dodge City, Kans	P.	302.3	54	58	+ 4	.....	.....
Louisville, Ky	T.	302.3	28	.....	.....	38	+10
San Francisco, Cal	T.	302.3	43	.....	.....	51	+ 8
Atlantic City, N. J	P.	300.8	38	45	+ 7	.....	.....
Baltimore, Md	T.	300.8	33	.....	.....	40	+ 7
Cincinnati, Ohio	T.	300.8	34	.....	.....	36	+ 2
Kansas City, Mo	P.	300.8	30	34	+ 4	.....	.....
St. Louis, Mo	T.	300.8	30	.....	.....	48	+18

Difference between instrumental and personal observations.—Cont'd.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
		H'rs.	%	%	%	%	%
Washington, D. C	P.	300.8	39	44	+ 5	.....	.....
Columbus, Ohio	T.	299.7	22	.....	.....	31	+ 9
Denver, Colo	P.	299.7	50	59	+ 9	.....	.....
Indianapolis, Ind	T.	299.7	36	.....	.....	52	+16
Philadelphia, Pa	T.	299.7	36	.....	.....	58	+22
Cheyenne, Wyo	P.	298.4	42	55	+13	.....	.....
Eureka, Cal	P.	298.4	34	35	+ 1	.....	.....
New York, N. Y.	T.	298.4	36	.....	.....	55	+19
Omaha, Nebr	P.	298.4	34	45	+11	.....	.....
Pittsburg, Pa	T.	298.4	24	.....	.....	28	+ 4
Salt Lake City, Utah	P.	298.4	17	32	+15	.....	.....
Binghamton, N. Y	T.	296.5	30	.....	.....	35	+ 5
Boston, Mass	T.	296.5	49	.....	.....	54	+ 5
Chicago, Ill	T.	296.5	29	.....	.....	31	+ 2
Cleveland, Ohio	T.	296.5	18	.....	.....	20	+ 2
Des Moines, Iowa	T.	296.5	35	.....	.....	38	+ 3
Detroit, Mich	T.	296.5	24	.....	.....	34	+10
Dubuque, Iowa	T.	296.5	36	.....	.....	29	− 7
Albany, N. Y.*	T.	295.4	36	.....	.....	59	+23
Buffalo, N. Y	T.	295.4	23	.....	.....	34	+11
Idaho Falls	T.	295.4	17	.....	.....	43	+26
Rochester, N. Y	T.	295.4	25	.....	.....	28	+ 3
Northfield, Vt	P.	293.8	34	47	+13	.....	.....
Portland, Me	T.	293.8	50	.....	.....	66	+16
Eastport, Me	P.	291.9	50	58	+ 8	.....	.....
Minneapolis, Minn†	T.	291.9	.....	.....	.....	28	.....
St. Paul, Minn.	P.	291.9	25	25	0	.....	.....
Portland, Oreg	T.	290.4	29	.....	.....	25	− 4
	P.	290.4	29	.....	.....	21	− 8
Bismarck, N. Dak	P.	288.7	43	53	+10	.....	.....
Helena, Mont	P.	288.7	39	41	+ 2	.....	.....
Seattle, Wash	T.	286.8	28	.....	.....	32	+ 4
Spokane, Wash	P.	286.8	26	29	+ 3	.....	.....

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the durations relative to possible sunshine are derived; the observers' personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for February, 1897, is 7 per cent for photographic and 7 per cent for thermometric records.

The details are shown in the preceding table, in which the stations are arranged according to the *total possible* duration of sunshine, and not according to the *observed* duration.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which reports of thunderstorms for the whole country were most numerous were: 20th, 201; 21st, 176; 22d, 187.

Thunderstorm reports were most numerous in: Illinois, 74; Kentucky, 77; Louisiana, 62; Missouri, 70; Tennessee, 63; Virginia, 68.

Thunderstorms were most frequent in: Florida and Georgia, 12 days; Louisiana, 14; Tennessee and Virginia, 10.

Auroras.—The evenings on which bright moonlight must